

**CADOTTE PROJECT  
RESOURCE  
RECLASSIFICATION**

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**STRATA OIL & GAS INC.**

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Dated the 28<sup>th</sup> day of April, 2010.

ORIGINAL SIGNED AND SEALED BY AUTHOR

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## 1 INTRODUCTION

In 2008 Norwest Corporation prepared a report of the Cadotte Project titled “Preliminary Feasibility Study of the Cadotte Leases, Alberta Canada” for Strata Oil & Gas Inc. That report was authored by J.D. Wright and J Deckert and was dated February 29, 2008. It included an estimate of recoverable bitumen for the Cadotte Project and this quantity was classified as “Discovered”, rather than “Contingent”. Several reasons for this classification were presented in the report but subsequent work has been completed by Norwest that shows that the recoverable resource can now be classified as “Contingent”. The following is a description of this work and a discussion of the results that now apply.

## **2 RESOURCE CLASSIFICATION IN THE PRELIMINARY FEASIBILITY STUDY**

The issue of the resource classification as was discussed in the Preliminary Feasibility Study, Section 4.3, included the following:

### **“4.3 CLASSIFICATION OF POTENTIALLY RECOVERABLE RESOURCES**

The probability of encountering bitumen reservoirs is high in the geological sequence evaluated in the Cadotte area. Therefore the judgment has been made that there are sufficient data available to classify the Discovered PIIP in accordance with the COGE Handbook criteria. In other circumstances, the recoverable portion of the Discovered PIIP might be classified as a Contingent Resource. However, in the Cadotte lease case there are several factors, and one in particular, that prevent such a resource classification being made. The major factor is that, at present, there is no pilot project that is applying in-situ recovery methods to bitumen in a hardrock carbonate host that can be used as a demonstration of recoverability. Not only is this the case for Canada but there are no suitable examples anywhere in the world. This means that existing pilot projects in clastic hosts, which have different physical characteristics from carbonates, have to be used for performance prediction. This additional risk prevents the “Contingent Resource” classification being made. The additional factors that also prevent classification as a Contingent Resource include:

1. A lack of a cost estimate for the full-field development and operation of a bitumen recovery and upgrading project;
2. Lack of permeability data for the target zones; and
3. Limited geologic and reservoir data samples for the target zones”

However, Norwest subsequently became aware of the fact that there are several pilot projects that have been constructed in bitumen bearing carbonate host and these were operated for many years. Bitumen was successfully recovered from several of them. Consequently, a literature search was conducted to identify these projects and to evaluate the results that had been achieved. This was done in the context of the requirement for resource classification at Cadotte as presented above.

### 3 LITERATURE SEARCH AND CARBONATE PILOT DATA EVALUATION

Norwest's literature search was extensive and was presented to Strata in an internal report titled "Literature Review for Bitumen Bearing Carbonate Reservoirs (July 17, 2008)". That report included a summary description of several pilot projects that were developed in Alberta in bitumen-bearing carbonate deposits in the 1970's and 1980's. The report also included a discussion of the results obtained and the relevance to the Cadotte project. An extract from its summary describes the literature search study as follows:

"The following ... literature review is part of a larger study concerning the extraction of bitumen from carbonate deposits. Much of the underlying test data was funded by the Government of Alberta and all of that work was completed in the period from 1975 to 1988. The work of that period is highlighted by the construction of two large scale pilot projects for bitumen in carbonate and both of these mainly addressed the testing of the Cyclic Steam Stimulation (CSS) method of production; however testing of other production methods such as Wet Combustion was also conducted. The review also addresses more recent and even current publications on the topic. These publications are concerned with the same production techniques and others as well. The importance of this material for the engineering design of current pilot projects for the extraction of bitumen from carbonate is quite obvious; they have direct relevance to the design of a pilot in carbonate at other locations such as that of the Debolt Formation on Strata's Cadotte leases.

The Alberta Provincial Government funded pilot projects were administered by AOSTRA, the Alberta Oil Sand Research and Technology Authority. The work on the pilots was undertaken by Unocal at two principal sites referred to as Buffalo Creek and McLean, addressing Grosmont Formation carbonate in both cases. The Buffalo Creek 10A Pilot commenced operation in 1980 and testing continued until 1987. The scale of this pilot can be judged by the fact that the combined expenditures for this project alone from 1980 to 1986 are reported to be \$14 million, in currency of that time. Once the early results from the Buffalo Creek pilot were judged to be successful a new and expanded pilot was constructed by Unocal fairly close to the Buffalo Creek site. This was referred to as the McLean Pilot and it commenced operation in 1982. Once again the field testing effort was very extensive and the expenditures for this pilot are reported to be about \$ 20 million for the period from 1982 to 1986.

All of this data, when combined with field testing and ore characterization work that Strata has completed at Cadotte to date, is sufficient to allow Norwest to construct a computer

simulation of a pilot design for the testing of Debolt bitumen producibility at Cadotte. It is also sufficient to demonstrate the existence of a carbonate pilot, not previously available, needed for the classification of the recoverable resource estimate for that area as “Contingent”.”

The production test results that AOSTRA reported for the Buffalo Creek and McLean pilots is fully described in Section 4 of the report included as Appendix A. For single well tests, Buffalo Creek achieved a bitumen production rate of as much as 440 bbls/d and for McLean the highest bitumen production rate was 940 bbls/d. AOSTRA described the Buffalo Creek pilot as being successful. They also considered McLean to be a success but with more erratic results. The summary from Appendix A commented further:

“The literature review has been conducted on data and publications concerning pilot projects carried out in the carbonate of the Grosmont Formation, to better understand the potential behaviour of similar carbonate in the Debolt Formation in the Cadotte area. It was found that:

- The fluid and rock properties are very similar in both the Grosmont and the Debolt Formations, with a tendency to be more desirable in the Debolt because of the somewhat higher reservoir pressure temperature.
- The numerous thermal projects conducted in Grosmont Formation have had mixed results with surprisingly high production in some of them, especially when using the Cyclic Steam Stimulation recovery method. This technique is considered very promising for application on the Strata Cadotte Project. However, a good understanding and characterization of the formation is important to ensure success. Drive processes, such as Steamflood and In-situ Combustion have been less successful; they have experienced premature breakthrough due to a broad process of “fingering” produced by high permeability channels;
- Both the Grosmont and Debolt Formations are reported to have “heterogeneous” characteristics that provide high lateral permeability inside ore zones with very high oil saturation. “Breccia zones” or “Bitumen Breccia” are reported in both cases;
- Laboratory tests show high recovery factors with thermal processes, but other methods are also being extensively tested. The most promising appear to be those using solvents. Sonic systems are also being tested;

- Reservoir simulation seems to confirm the channelling character of the rock in terms of steam and combustion gas behavior;
- Current bitumen recovery testing and development activity from carbonate is growing as the oil prices make these reservoir types and fluids more commercial; and
- Alternative sources for thermal energy generation are also being considered to exploit carbonate reservoirs, as water consumption costs and carbon dioxide disposal costs will rise significantly in the near future.”

The physical properties of the bitumen and the bitumen reservoirs for the Grosmont and Debolt Formations are compared on Table 3.1 and this demonstrates the similarity of these two carbonate reservoirs .

**TABLE 3.1**  
**COMPARISON OF PHYSICAL PROPERTIES**  
**GROSMONT FORMATION (BUFFALO CREEK) VS DEBOLT FORMATION (CADOTTE)**

PROPERTY	UPPER GROSMONT ORE <sup>1</sup>	CADOTTE DEBOLT ORE
Depth of Top Zone (m)	285	451 - 597
Zone thickness (m)	30 - 34	27 - 29
Net Pay Thickness (m)	12	10 - 19
Average Porosity (%)	19	+24
Avg. Horizontal Permeability (mD)	400	500
Average Water Saturation (%)	25	7 - 37
Average Oil Saturation (%)	75	67 - 93
Original Formation Pressure (kPa)	1400	4100
Original Formation Temperature ( C)	10 - 11	17 - 20
Bitumen Gravity ( API)	7	9
Bitumen Density (kg/m3)	1.037	1.007
Bitumen Viscosity at Res. Temp (cP)	1,800,000	650,000 - 1,770,000

NOTE 1: Sources are:

- (A) Union Oil Company of Canada Ltd., Vandermeer J.G. and Presber T.C., “Heavy Oil Recovery from the Grosmont Carbonates of Alberta (May 1980)”, Seminar on Nonconventional Oil Technology, Calgary, Alberta, (May 1980).
- (B) AOSTRA report, “Four Annual Survey of Experimental Oil Sands, Heavy Oil and Enhanced Recovery, Pilot Projects (March 1986)”.

#### **4 VERIFICATION OF THE AOSTRA CONCLUSIONS AND THE USE OF THOSE RESULTS**

Several groups have studied the test results originally obtained by Union Oil and provided to AOSTRA for its Pilot projects at Buffalo Creek and McLean. These include other potential bitumen bearing carbonate project operators such as Laricina Energy Ltd. who are in the process of developing such a project in the Grosmont carbonate at its Saleski project site. Laricina has published reports to show that they agree with and accept the results that were presented by AOSTRA.

In addition other groups that are independent of the project operators have also studied the results for the pilots as provided by AOSTRA. These include the Petroleum Technology Alliance of Canada (PTAC) and the Alberta Research Council. In all cases these groups have validated the conclusions that were drawn by AOSTRA concerning the bitumen-bearing carbonate pilots.

As a result, several of the project operators have used the results as a demonstration of the producibility of bitumen from carbonate host rocks and have apparently classified their recoverable resource as “Contingent”.

## **5 IMPLICATIONS FOR CLASSIFICATION OF BITUMEN RESOURCES AT CADOTTE**

With respect to the original conclusion drawn concerning the lack of production testing from bitumen bearing carbonate deposits, as expressed in Section 4 of the Cadotte Preliminary Feasibility Study and reiterated in Section 2 above, the information in Appendix A clearly shows that pilot projects for bitumen-bearing carbonate hosts do exist. In addition the data available for those pilots shows that production testing from them was successful and the results of the tests have been confirmed by a variety of groups. Consequently, the statement in the Preliminary Feasibility Study that there are no such pilots was incorrect. Furthermore the results of pilot testing have been sufficiently well documented and widespread that others have already used the results for the classification of their recoverable resources of this type as “Contingent”. With respect to this issue there is no reason for the recoverable resource estimate for the Cadotte project not to be similarly classified.

The discussion of the Preliminary Feasibility Study included three other, less important issues that also influenced the classification of resources that was used at that time. These are also given in Section 2 above. For these issues:

- With regard to point 1), the feasibility study was only based on the sale of bitumen, not upgraded oil, so no cost estimate for upgrading was needed or appropriate. The cost of full field development of a bitumen extraction project was later included in the cost estimate for the project. Hence this issue has been addressed;
- With regard to point 2), after the preliminary feasibility study was completed a field program Hot Water testing was conducted in one of the wells at Cadotte. This was specifically aimed at and achieved the collection of Permeability data, at a level that is sufficient for the present purpose. More data will be required but that is part of a further planned program for development of the project and is one of the contingencies that will have to be met;
- With regard to 3), more data is required but this is a normal requirement for all projects of this type. While the Buffalo Creek and MacLean Pilots do exist and they are sufficient to address the deficiencies for the resource classification, Strata, like all the operators of similar projects, will still have to develop a pilot for this project to demonstrate its commercial and technical viability. This is listed as a contingency requirement that has to be met before the project can proceed and before the bitumen can be classified as any category of reserves.

This means that all of the requirements that were set in the Preliminary Feasibility study for classification of the recovered bitumen as a Contingent Resource have already been met. This report acknowledges this and reclassifies the Cadotte recoverable resource accordingly.

## 6 RECLASSIFICATION OF CADOTTE PROJECT RECOVERABLE RESOURCES

Table 6.1 below shows the in place Discovered resource as presented in the Preliminary Feasibility Study. This table is not modified from the original in any way.

**TABLE 6.1**  
**EFFECTIVE OBIP FOR THE CADOTTE AREA BY TARGET ZONE**  
**IN MILLIONS OF STOCK TANK BARRELS (MMSTB)**

<b>Formation</b>	<b>Low Estimate</b>	<b>Most Likely Estimate</b>	<b>High Estimate</b>
Bluesky/Gething	N/A	N/A	103
Debolt	1,443	1,500	1,503
Elkton	N/A	490	644
<b>Total</b>	<b>1,443</b>	<b>1,990</b>	<b>2,251</b>

In the present report Table 6.2 presents the recoverable resource from the Preliminary Feasibility Study, originally described as “Potentially recoverable portion of the Discovered PIIP”, now reclassified as a Contingent Resource, as follows:

**TABLE 6.2**  
**CONTINGENT RESOURCE FOR THE CADOTTE AREA**  
**BY TARGET ZONE IN MILLIONS OF STOCK TANK BARRELS (MMSTB)**

<b>Formation</b>	<b>P90 (Low Estimate)</b>	<b>P50 (Most Likely Estimate)</b>	<b>P10 (High Estimate)</b>
Bluesky/Gething	N/A	N/A	39
Debolt	245	390	571
Elkton	N/A	127	245
<b>Total</b>	<b>245</b>	<b>517</b>	<b>855</b>

Note that only the classification of the resource, and not the quantities, is modified from the original as stated in the Preliminary Feasibility Study.

## **6.1 CONTINGENCIES TO BE SATISFIED FOR CADOTTE CONTINGENT RESOURCES**

With the Cadotte Recoverable bitumen quantity classified as a Contingent resource, it is a requirement for reporting to identify and list the contingencies. These are as follows:

- The company will have to develop a suitable Debolt Formation carbonate Pilot to demonstrate the technical and commercial viability of operating any specific planned in situ recovery method for this project. The cost estimate for development of the project includes a provision for completing this work;
- The company will have to obtain all of the legal permits necessary for the initiation of the project and for construction and operation of it;
- The company will have to secure a suitable market for the bitumen;
- The company will have to ensure that all of the environmental requirements, including those that relate to water usage and disposal are satisfied.